METHOD FOR ACTUATING A TACTILE INTERFACE LAYER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/325,772, filed on 19 Apr. 2010, which is incorporated in its entirety by this reference.

[0002] This application is related to U.S. application Ser. No. 11/969,848 filed on 4 Jan. 2008 and entitled "System and Method for Raised Touch Screens", U.S. application Ser. No. 12/319,334 filed on 5 Jan. 2009 and entitled "User Interface System", U.S. application Ser. No. 12/497,622 filed on 3 Jul. 2009 and "User Interface System and Method", which are all incorporated in their entirety by this reference.

TECHNICAL FIELD

[0003] This invention relates generally to tactile user interfaces, and more specifically to a new and useful method for interpreting gestures as commands for a tactile interface layer with a deformable region.

BRIEF DESCRIPTION OF THE FIGURES

[0004] FIG. **1** is a schematic representation of the method of the first preferred embodiment.

[0005] FIG. **2** is a schematic representation of the method of the second preferred embodiment.

[0006] FIG. **3** is a top view of a variation of the tactile interface layer.

[0007] FIG. **4** is a cross sectional view of a variation of the tactile interface layer.

[0008] FIG. **5** is a cross-sectional view illustrating the operation of a deformable region of a tactile interface layer.

[0009] FIG. **6** is a cross sectional view of a variation of the tactile interface layer with a valve.

[0010] FIGS. **7-9** are schematic representations of a first, second, and third variation in the manipulation of the firmness of the deformed particular region in the first preferred embodiment.

[0011] FIGS. **10** and **11** are schematic representations of a first and second variation in the manipulation of a first and second particular region in the second preferred embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] The following description of the preferred embodiments of the invention is not intended to limit the invention to these preferred embodiments, but rather to enable any person skilled in the art to make and use this invention.

[0013] As shown in FIGS. **1** and **2**, the method S**100** for actuating a tactile interface layer **100** of a device that defines a surface with a deformable region of the preferred embodiments includes deforming a deformable region of the surface into a formation tactilely distinguishable from the surface Step S**110** and S**210**, detecting a force from the user on the deformed region of the surface Steps S**120** and S**220**, interpreting a command for the deformable region of the surface based on the detected force, and manipulating the deformable regions based on the command. In the first preferred embodiment, as shown in FIG. **1**, the step of interpreting a command includes interpreting the force on the deformable region as a command for the firmness of the deformed deformable region Step S**130** and the step of manipulating the deformable regions based on the command includes manipulating the firmness of the deformable region of the surface based on the command Step S**140**. In the second preferred embodiment, as shown in FIG. **2**, the tactile interface layer includes a first and second deformable region and the step of interpreting a command includes interpreting the force on the deformed deformable region as a command to undeform the first deformable region and to deform the second deformable region into formation tactilely distinguishable from the surface Step S**230** and the step of manipulating the deformable regions based on the command includes manipulating the first and second deformable regions based on the command Step S**240**. The method S**100** for actuating a tactile interface layer **100** of a device may also include detecting a force from the user on a plurality of deformed deformable regions, which may also include the step of detecting the sequence in which a force is detected on each of the deformed deformable regions. In this variation, the step of interpreting a command may include interpreting a command for at least one deformable region of the surface based on the detected sequence of forces. However, any other suitable type of force detection relative to the deformed deformable regions of the surface may be used.

[0014] The method S**100** of the first and second preferred embodiments for actuating a tactile interface layer **100** may also include the step of receiving a user input for a particular interpretation of a force as a command Step S**150**. The step of receiving a user input for a particular interpretation of a force as a command Step S**150** may include receiving a user input from the user of the device, but may alternatively include receiving a user input from a person remote from the device, for example, a third party such as the manufacturer or a second user. However, the user input for a particular interpretation of a force as a command may be received from any other suitable user. The method S**100** is preferably applied to a tactile interface layer **100** that is to be used with an electronic device. More preferably, in an electronic device that benefits from an adaptive user interface. The electronic device may or may not include a display and/or a touch sensor, for example, an automotive console, a steering wheel, a desktop computer, a laptop computer, a tablet computer, a television, a radio, a desk phone, a mobile phone, a PDA, a personal navigation device, a personal media player, a camera, a watch, a remote control, a mouse, a trackpad, or a keyboard. The tactile interface layer **100** may, however, be used as the user interface for any suitable device that interfaces with a user in a tactile and/or visual manner. The tactile interface layer **100** is preferably integrated with the device, for example, in the variation wherein the tactile interface layer **100** includes a sensor **140**, the tactile interface layer **100** is preferably assembled into the device and presented to the user as one unit. Alternatively, the tactile interface layer **100** may function as an accessory to a device, the user may be presented the tactile interface layer **100** and the device as two separate units wherein, when coupled to each other, the tactile interface layer **100** functions to provide tactile guidance to the user and/or to receive user inputs. However, the method S**100** may be applied to any other suitable arrangement of the tactile interface layer **100**.

[0015] The method S**100** of the preferred embodiments is preferably applied to any suitable tactile interface layer that includes deformable regions. In particular, as shown in FIGS. **3-5**, the method S**100** of the preferred embodiments may be applied to the user interface system as described in U.S. application Ser. Nos. 11/969,848, 12/319,334, and 12/497,